

## Appendix 1. Tables

Table 1. General locations of documented populations of the typical form of <i>Cylindropuntia multigeniculata</i> .								
Site no.	Map fig.	Source Year*	Site Name; 7.5' USGS topographic map quadrangle County; Survey Location	Est. Acres/ hectares	Elev. Range ft/m	Est. Inds. Inds./acre ****	Threats **	Management***
HISTORIC SITES (see Morefield 1992)								
1		2004	Blue Diamond Hill; Blue Diamond Clark; Blue Diamond Hill	269/109	3450-4350/1050-1325	6250/23.2	d, g, m, r, u	b, p
NEW SITES DISCOVERED IN NEVADA AND ARIZONA								
Typical form								
1,2	3	2004	La Madre Mountain; La Madre Mountain, Blue Diamond NE, Grapevine Spring	5060/2050	4200-5800/1280-1770	76400/15.1	d, g, m, r, u	b, rr
3,4,5	4	2004	McCullough Range; Sloan, Sloan NE, Sloan SE Clark; McCullough Range, from Black Mountain to the south and southwest	3780/1530	3400-5000/1015-1525	20030/5.3	d, g, m, r, u	b, sc
6	5	2004	Gass Peak; Gass Peak Clark; Gass Spring area	125/50	5150-5800/1570-1770	200/1.6	g	d
Spiny fruited form								
7		2004	Black Mountains; Burns Spring Mohave; Burns Spring area	1600/650	3800-4600/1160-1400	12320/7.7	g, d	b, s, p
8,9		2004	Hualapai Wash area; Senator Mountain, Gold Basin, Garner Mountain Mohave; Hualapai and White Elephant Washes	4940/2000	2400-4700/730-1430	156600/31.7	g, m, r, p	b, n, p
10		2004	Bonelli Peak; Garrett Butte, Jumbo Peak Clark; north base of Bonelli Peak, south of Gold Peak	1975/800	2800-3450/850-1050	12440/6.3	g	b

\* Most recent year documented.

\*\* b: Bureau of Land Management, Las Vegas District; p: private, municipal, County; refuge; National Park; d: Desert National Wildlife Range, s: state; n: National Park Service, Lake Mead National Recreation Area; rr: Red Rock Canyon National Conservation Area; sc: Sloan Canyon National Conservation Area.

\*\*\* d: urban/ residential development; g: grazing/ trampling/ browsing by domestic or feral animals; m: mineral exploration/ development; o: off-road vehicle use; p: public purpose uses (military, nuclear testing, etc.); r: road development/ maintenance; u: utility corridor development/ maintenance; x: competition with invasive exotics; y: herbivory from domestic/feral animals.

\*\*\*\* Individuals per acre based on 30 m wide belt transects.

Table 2. Common plant associates of <i>Cylindropuntia multigeniculata</i> .	
Scientific name	Common name
<i>Acacia greggii</i>	cat-claw acacia
<i>Agave utahensis</i>	Utah agave
<i>Ambrosia dumosa</i>	burrobush
<i>Aristida purpurea</i>	purple three-awn
<i>Atriplex canescens</i>	four-wing saltbush
<i>Brickellia atractyloides</i>	spearleaf brickellbush
<i>Brickellia californica</i>	Californnia brickellbush
<i>Buddleja utahensis</i>	Utah butterflybush
<i>Coleogyne ramosissima</i>	blackbrush
<i>Cylindropuntia echinocarpa</i>	silver cholla
<i>Cylindropuntia acanthocarpa</i>	buckhorn cholla
<i>Cylindropuntia ramosissima</i>	diamond cholla
<i>Echinocereus engelmannii</i>	Engelmann hedgehog
<i>Echinocereus triglochidiatus</i> var. <i>mojavensis</i>	Claret-cup cactus
<i>Encelia virginensis</i>	Virgin River brittlebush
<i>Ephedra nevadensis</i>	Nevada jointfir
<i>Ericameria linearifolia</i>	narrowleaf goldenbush
<i>Eriogonum fasciculatum</i>	eastern Mojave-buckwheat
<i>Eriogonum heermannii</i>	Heermann-buckwheat
<i>Erioneuron pulchellum</i>	fluffgrass
<i>Ferocactus acanthodes</i> ( <i>F. cylindraceus</i> )	California barrel cactus
<i>Grayia spinosa</i>	spiny hopage
<i>Gutierrezia microcephala</i>	threadleaf snakweed
<i>Gutierrezia sarothrae</i>	common snakeweed
<i>Juniperus californica</i>	California juniper
<i>Krameria erecta</i>	littleleaf ratany
<i>Krascheninnikovia lanata</i>	winterfat
<i>Larrea tridentata</i>	creosote-bush

Table 2. Common plant associates of *Cylindropuntia multigeniculata*.

Scientific name	Common name
<i>Mammillaria tetrancistra</i>	common fishhook cactus
<i>Muhlenbergia porteri</i>	bush muhly
<i>Opuntia basilaris</i>	beavertail cactus
<i>Opuntia erinacea</i>	grizzlybear pricklypear
<i>Pleuraphis rigida</i>	big galleta
<i>Prunus fasciculatus</i>	desert almond
<i>Psoralea fremontii</i>	Fremont dalea
<i>Purshia stansburiana</i>	common cliffrose
<i>Quercus turbinella</i>	Sonoran scrub oak
<i>Salazaria mexicana</i>	Mexican bladdersage
<i>Salvia dorrii</i>	purple sage
<i>Salvia mohavensis</i>	Mojave sage
<i>Sphaeralcea ambigua</i>	desert glogemallow
<i>Thamnosma montana</i>	turpentinebroom
<i>Tiquilia canescens</i>	woody crinklemat
<i>Tridens muticus</i>	slim tridens
<i>Xylorhiza tortifolia</i>	Mojave woodyaster
<i>Yucca brevifolia</i>	Joshua tree
<i>Yucca schidigera</i>	Mojave yucca

Table 3. Habitat description and common associated species for *C. multigeniculata*, by population.

Population	Habitat description	Associated species
Blue Diamond Hill area (type locality)	Generally SW-facing rocky limestone slopes. Succulent scrub.	<i>Agave utahensis</i> , <i>Ambrosia dumosa</i> , <i>Aristida purpurea</i> , <i>Artemisia bigelovii</i> , <i>Buddleja utahensis</i> , <i>Coleogyne ramosissima</i> , <i>Coryphantha chlorantha</i> , <i>Cylindropuntia acanthocarpa</i> , <i>Echinocereus engelmannii</i> , <i>Ephedra trifurca</i> , <i>E. viridis</i> , <i>Eriogonum heermanii</i> , <i>E. inflatum</i> , <i>Erioneuron pulchellum</i> , <i>Ferocactus cylindraceus</i> , <i>Gutierrezia microcephala</i> , <i>G. sarothrae</i> , <i>Larrea tridentata</i> , <i>Mammillaria tetrancistra</i> , <i>Muhlenbergia porteri</i> , <i>Opuntia erinacea</i> , <i>Purshia stansburiana</i> , <i>Sphaeralcea ambigua</i> , <i>Thymophylla pentachaeta</i> , <i>Tiquilia canescens</i> , <i>Tridens mutica</i> , <i>Yucca brevifolia</i> , and <i>Y. schidigera</i> .
La Madre Mountain, NV	Steep slopes and ridgelines with dissecting drainages and associated scree fields. North- and south-facing, well-drained slopes of limestone bedrock and fragments. Succulent scrub.	<i>Achnatherum speciosum</i> , <i>Agave utahensis</i> , <i>Ambrosia dumosa</i> , <i>Arenaria macradenia</i> , <i>Aristida purpurea</i> , <i>Atriplex canescens</i> , <i>Bebbia juncea</i> , <i>Buddleja utahensis</i> , <i>Cercocarpus intricatus</i> , <i>Chrysothamnus nauseosus</i> , <i>Coleogyne ramosissima</i> , <i>Cryptantha confertiflora</i> , <i>Cylindropuntia echinocarpa</i> , <i>C. ramosissima</i> , <i>Echinocereus engelmannii</i> , <i>E. triglochidiatus</i> var. <i>mojavensis</i> , <i>Ephedra nevadensis</i> , <i>E. viridis</i> , <i>Eriogonum fasciculatum</i> , <i>E. heermanii</i> , <i>E. inflatum</i> , <i>E. microthecum</i> , <i>Eucnide urens</i> , <i>Ferocactus cylindraceus</i> , <i>Grayia spinosa</i> , <i>Krameria erecta</i> , <i>Krascheninnikovia lanata</i> , <i>Larrea tridentata</i> , <i>Lepidium fremontii</i> , <i>Mortonia utahensis</i> , <i>Opuntia basilaris</i> , <i>Penstemon bicolor</i> , <i>Petrophyton caespitosum</i> , <i>Prunus fasciculatus</i> , <i>Purshia stansburiana</i> , <i>Salazaria mexicana</i> , <i>Tetradymia canescens</i> , <i>Thamnosma montana</i> , <i>Tiquilia canescens</i> , <i>Xylorhiza tortifolia</i> , and <i>Yucca schidigera</i> .
McCullough Range, NV	The McCullough Range is composed of thick, uplifted basalt flows with avalanches of large boulders and is cut by deep drainages. Individuals occur primarily on ridgelines and hilltops, north- to west-facing slopes, and ravine bottoms. Succulent scrub.	<i>Acacia greggii</i> , <i>Achnatherum hymenoides</i> , <i>A. speciosum</i> , <i>Ambrosia dumosa</i> , <i>Brickellia atractyloides</i> , <i>B. desertorum</i> , <i>Cylindropuntia ramosissima</i> , <i>Echinocereus engelmannii</i> , <i>Elymus elymoides</i> , <i>Encelia virginensis</i> , <i>Ephedra nevadensis</i> , <i>E. torreyana</i> , <i>Ericameria laricifolia</i> , <i>Eriogonum fasciculatum</i> , <i>E. heermanii</i> , <i>E. inflatum</i> , <i>Erioneuron pulchellum</i> , <i>Ferocactus cylindraceus</i> , <i>Grayia spinosa</i> , <i>Krameria erecta</i> , <i>Krascheninnikovia lanata</i> , <i>Larrea tridentata</i> , <i>Mammillaria tetrancistra</i> , <i>Mirabilis bigelovii</i> , <i>Muhlenbergia porteri</i> , <i>Opuntia basilaris</i> , <i>Petalonyx nitida</i> , <i>Pleuraphis rigida</i> , <i>Prunus fasciculatus</i> , <i>Psoralea fremontii</i> , <i>Salazaria mexicana</i> , <i>Salvia mojavensis</i> , <i>Sclerocactus johnsonii</i> , <i>Sphaeralcea ambigua</i> , <i>Thamnosma montana</i> , <i>Tridens mutica</i> , <i>Viguiera parishii</i> , <i>Xylorhiza tortifolia</i> , <i>Yucca brevifolia</i> , and <i>Y. schidigera</i> .
Gass Peak, NV	North-facing slope of slightly metamorphic granite, <i>Coleogyne ramosissima</i> scrub. Individuals mainly associated with rock outcroppings.	<i>Artemisia tridentata</i> , <i>Chrysothamnus nauseosus</i> , <i>Cylindropuntia echinocarpa</i> , <i>Echinocactus polycephalus</i> , <i>Echinocereus engelmannii</i> , <i>Eriogonum fasciculatum</i> , <i>Erioneuron pulchellum</i> , <i>Fallugia paradoxa</i> , <i>Opuntia basilaris</i> , <i>Purshia stansburiana</i> , <i>Setaria macrostachya</i> , and <i>Yucca baccata</i> .

Bonelli Peak, NV	Topography variable with hills, ridges, and drainages of basalt or granitic bedrock and associated fragments; Individuals occurred primarily on lower slopes of decomposed granite, in broad washes of granitic rock and gravel, and on north-facing slopes.	<i>Acacia greggii</i> , <i>Ambrosia eriocentra</i> , <i>Brickellia atractyloides</i> , <i>Ephedra nevadensis</i> , <i>Ericameria linearifolia</i> , <i>Eriogonum fasciculatum</i> , <i>Ferocactus cylindraceus</i> , <i>Hymenoclea salsola</i> , <i>Prunus fasciculatus</i> , <i>Psoralea fremontii</i> , <i>Quercus turbinella</i> , <i>Thamnosma montana</i> , and <i>Yucca schidigera</i> .
Hualapai Wash, AZ	Topography variable with hills, ridges, and drainages of granite and schist and associated fragments. The highest density of individuals occur in the wash to the east of Hualapai Wash. High densities of individuals occur on north- and west-facing slopes and higher drainages of the mountains. Fewer individuals occur in the valley.	<i>Acacia greggii</i> , <i>Agave utahensis</i> , <i>Ambrosia dumosa</i> , <i>Aristida purpurea</i> , <i>Artemisia ludoviciana</i> , <i>Atriplex canescens</i> , <i>Brickellia californica</i> , <i>Coleogyne ramosissima</i> , <i>Cylindropuntia acanthocarpa</i> var. <i>coloradensis</i> , <i>Echinocactus polycephalus</i> , <i>Echinocereus engelmannii</i> , <i>Echinomastus johnsonii</i> , <i>Ephedra nevadensis</i> , <i>E. nevadensis</i> , <i>Eriogonum fasciculatum</i> , <i>E. wrightii</i> , <i>Erioneuron pulchellum</i> , <i>Ferocactus cylindraceus</i> , <i>Gutierrezia sarothrae</i> , <i>Larrea tridentata</i> , <i>Lycium exertum</i> , <i>Muhlenbergia porteri</i> , <i>Opuntia erinacea</i> , <i>O. phaeacantha</i> , <i>Phoradendron californica</i> , <i>Psoralea fremontii</i> , <i>Salvia dorrii</i> , <i>Stanleya pinnata</i> , <i>Thamnosma montana</i> , <i>Tiquilia canescens</i> , <i>Yucca brevifolia</i> , and <i>Y. schidigera</i> .
Black Mountains, AZ	Basalt ridges and associated washes. Highest densities of individuals occur on rocky slopes of various aspects, a few individuals occur in the alluvium of valleys.	<i>Acacia greggii</i> , <i>Coleogyne ramosissima</i> , <i>Cylindropuntia acanthocarpa</i> , <i>C. echinocarpa</i> , <i>Dichelostemma pulchellum</i> , <i>Encelia virginensis</i> , <i>Encelia virginensis</i> , <i>Ephedra aspera</i> , <i>Ericameria linearifolia</i> , <i>Eriogonum fasciculatum</i> , <i>E. wrightii</i> , <i>Ferocactus cylindraceus</i> , <i>Gutierrezia microcephala</i> , <i>Juniperus californica</i> , <i>Penstemon parryi</i> , <i>Pleuraphis rigida</i> , <i>Quercus turbinella</i> , <i>Salvia dorrii</i> , <i>Yucca schidigera</i> , and <i>Ziziphus obtusifolia</i> .

Table 4. Period of Record Monthly Climate Summary for Red Rock Canyon Conservation Area, Western Regional Climate Center, [wrcc@dri.edu](mailto:wrcc@dri.edu). Period of Record: 5/ 1/1977 to 12/31/2003 (36° 05' N 115° 27' W, 3,780 feet elevation).

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	52.9	57.2	63.4	71.2	80.6	91.1	96.8	94.9	87.7	76.7	61.7	53.9	74.0
Average Min. Temperature (F)	30.1	33.1	38.5	44.9	53.3	63.3	70.2	68.5	59.3	47.7	35.7	29.6	47.8
Average Total Precipitation (in.)	1.69	2.14	2.16	0.61	0.29	0.13	0.96	1.17	0.49	0.37	0.77	0.81	11.60
Average Total Snowfall (in.)	0.8	0.8	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.4	2.4

Table 5. Period of Record Monthly Climate Summary for the Desert National Wildlife Range, Western Regional Climate Center, [wrcc@dri.edu](mailto:wrcc@dri.edu). Period of Record: 7/ 1/1948 to 12/31/2003 (36° 26' N 115° 22' W, 2,920 feet elevation).

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	57.2	62.0	68.1	76.6	86.0	96.3	102	99.8	92.4	80.2	65.9	57.3	78.6
Average Min. Temperature (F)	29.2	32.6	37.4	44.1	52.0	60.1	67.0	65.4	57.8	46.9	36.1	29.4	46.5
Average Total Precipitation (in.)	0.43	0.51	0.57	0.29	0.20	0.14	0.39	0.40	0.39	0.27	0.34	0.37	4.31
Average Total Snowfall (in.)	0.4	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.7

Table 6. Period of Record Monthly Climate Summary for Pierce Ferry 17 SSW, Arizona, Western Regional Climate Center, [wrcc@dri.edu](mailto:wrcc@dri.edu). Period of Record: 6/ 1/1963 to 7/31/1984 (35° 53' N 114° 05' W, 3,860 feet elevation).

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	51.1	55.7	60.6	67.6	79.1	90.2	95.9	93.4	86.3	74.6	61.0	52.1	72.3
Average Min. Temperature (F)	28.8	31.9	36.7	42.2	52.4	62.6	70.2	68.2	60.0	47.7	36.5	29.0	47.2
Average Total Precipitation (in.)	0.88	0.96	1.35	0.75	0.50	0.29	0.92	1.61	0.78	0.62	1.08	0.81	10.56
Average Total Snowfall (in.)	1.4	0.2	0.8	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.4	1.1	4.3

Table 7. Specimens at UNLV (University of Nevada, Las Vegas) that represent populations of *C. whipplei*, possibly with some morphological intermediacy to *C. multigeniculata*. Specimens arranged chronologically.

Collector	Collector's no./ UNLV accession no.	Date	Mountain Range/Drainage	Locality Data
T.L. Ackerman	31391	17 April 1976	Las Vegas Range	north slope of Peek-a-boo Canyon, near south entrance, Desert National Wildlife Range, 1768m elevation
T.L. Ackerman	31389	01 May 1976	Sheep Range, south slope	ridge north of Black Gate Canyon, Desert National Wildlife Range, 1951m elevation
T.L. Ackerman	30155	02 July 1979	Sheep Range	ridge north of Little Joe May Canyon, Desert National Wildlife Range, 1951 m elevation
T.L. Ackerman	30157	06 August 1979	Sheep Range	ridge S of Sawmill Cyn, Desert National Wildlife Range, 2256m elevation.
Leary P J	5455/ 42686	24 May 1996	Sheep Range	along rd to Sawmill Cyn, 0.3 mi E of jct with Mormon Well rd, Desert National Wildlife Refuge, 1700m elevation
Leary P J	5473/ 42697	28 May 1996	Sheep Range, SW	Blackgate Cyn, Desert National Wildlife Refuge, 1700 m elevation
Leary P J	5513	14 June 1996	Sheep Range	in broad wash portion of upper Peek-a-boo Cyn, Desert National Wildlife Refuge, 1800m elevation
Niles W E	5036	13 June 1997	Delamar Mtns.	about 8 road miles north of the Kane Springs Valley Road, 1550m elevation

Table 8. Specimens at UNLV (University of Nevada, Las Vegas) identified by M. Baker as *C. multigeniculata*. Specimens arranged chronologically.

Collector	Collector's no./ UNLV accession no.	Date	Mountain Range/Drainage	Locality Data
Typical form (see also type specimens, under taxonomy heading)				
M. L. Boulton	s.n./ 19231	10 May 1980		1.2 km NE of Blue Diamond, occurring on the S face of an open ridge with a 20-25 d S slope
J. C. Fischer Jr.	TE59/ 23777	15 August 1980		Blue Diamond Hill, from type locality, Blue Diamond Quad
M. A. Baker et al.	15153/ 54953	13 February 2003	McCullough Range	8.3 kilometers west/southwest of Black Mountain summit, 20 kilometers southwest of Henderson
M. A. Baker et al.	15156/ 54952	13 February 2003		8.8 kilometers west/northwest of Lone Mountain summit, northeast of Deer Pasture, south of Harris Spring Canyon, La Madre Mountain; northwest of Las Vegas
M. A. Baker et al.	15154/ 54951	14 February 2003		9.8 kilometers west/northwest of Lone Mountain summit, northeast of Deer Pasture, south of Harris Spring Canyon, La Madre Mountain; northwest of Las Vegas
M. A. Baker et al.	15304/ 54954	22 April 2003		9.8 kilometers west/northwest of Lone Mountain summit, northeast of Deer Pasture, south of Harris Spring Canyon, La Madre Mountain; northwest of Las Vegas
Spiny-fruited form				
Niles W E	4999/ 34725	09 May 1997	Garnet Valley	In wash gravels; north base of Bonelli Peak; Gold Butte area, 1097m elevation
M. A. Baker et al.	15158/ 54955	06 March 2003		0.5 kilometer east/northeast of Blue Bird Mine, 3 kilometers east of Hualapai Wash, 18 kilometers east/northeast of Senator Mountain, about 80 kilometers north of Kingman

Table 9. Specimens of *Cylindropuntia multigeniculata* at Arizona State University (ASU). Specimens arranged chronologically by population.

Collector & Number	Date
<b>Type Locality, near Blue Diamond</b>	
<i>MAB 4963</i>	3 May 1984
<i>MAB, TW &amp; DH 11374-A</i>	17 April 1994
<i>MAB, TW &amp; DH 11374.2</i>	17 April 1994
<i>MAB &amp; JF 13666</i>	1 November 1999
<i>MAB &amp; JF 13667</i>	1 November 1999
<i>MAB &amp; JF 13671 (C. acanthocarpa × C. multigeniculata)</i>	1 November 1999
<i>MAB &amp; JF 13671.2</i>	1 November 1999
<b>La Madre Mountain</b>	
<i>MAB &amp; GG 15150</i>	12 February 2003
<i>MAB &amp; GG 15151</i>	12 February 2003
<i>MAB, JF &amp; GG 15154</i>	14 February 2003
<i>MAB, JF &amp; GG 15156</i>	14 February 2003
<i>MAB 15304</i>	22 April 2003
<i>MAB &amp; RR 15488</i>	20 June 2003
<b>McCullough Range</b>	
<i>MAB, JF &amp; GG 14306</i>	9 April 2002
<i>MAB, JF &amp; GG 15152</i>	13 February 2003
<i>MAB, JF &amp; GG 15153</i>	13 February 2003
<i>MAB 15303</i>	13 April 2003
<b>Bonelli Peak</b>	
<i>MAB 15305</i>	22 April 2003
<i>MAB 15305.1</i>	22 April 2003
<i>MAB 15305.3</i>	22 April 2003
<i>MAB 15306 (C. acanthocarpa × C. multigeniculata)</i>	22 April 2003
<b>Hualapai Wash/ Elephant Wash</b>	
<i>MAB 13650</i>	30 October 1999
<i>MAB 15158</i>	6 March 2003

Table 9. Specimens of *Cylindropuntia multigeniculata* at Arizona State University (ASU). Specimens arranged chronologically by population.

Collector & Number	Date
<i>MAB &amp; DB 15214</i>	31 March 2003
<b>Black Mountains</b>	
<i>MAB, MP, JA &amp; PG 14312</i>	9 April 2003
<i>MAB, MP, JA &amp; PG 14313</i>	9 April 2003
<i>MAB 15256</i>	9 April 2003
<i>MAB 15257</i>	9 April 2003
<i>MAB 15258</i>	9 April 2003
<i>MAB 15259</i>	9 April 2003
<i>MAB 15260</i>	9 April 2003
<i>MAB 15261</i>	9 April 2003
<i>MAB 15262</i>	9 April 2003
<i>DB = Danielle Baker, DH = Donna Harris, GG = Gina Glenne, JA = Jon Anderson, JF = Jody Fraser, MP = Mark Porter, PG = Patrick Griffith, RR = Rafael Routson, TW = Theresa Wright</i>	